Calculus 1 Workbook

Linear approximation and linearization

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MATH

LINEAR APPROXIMATION

■ 1. Find the linearization of $f(x) = x^3 - 4x^2 + 2x - 3$ at $x = 3$ and use the linearization to approximate $f(3.02)$.

■ 2. Find the linearization of $g(x) = \sqrt{8x - 15}$ at $x = 8$ and use the linearization to approximate $f(8.05)$.

■ 3. Find the linearization of $h(x) = 2e^{x-4} + 6$ at $x = 5$ and use the linearization to approximate $h(5.1)$.

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LINEAR APPROXIMATION TO ESTIMATE A ROOT

- 1. Use linear approximation to estimate $\sqrt[5]{34}$.

- 2. Use linear approximation to estimate $\sqrt[8]{260}$.

- 3. Use linear approximation to estimate $\sqrt[4]{85}$.

- 4. Use linear approximation to estimate $\sqrt[4]{615}$.

- 5. Use linear approximation to estimate $\sqrt{95}$.

- 6. Use linear approximation to estimate $\sqrt[3]{700}$.

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LINEARIZATION

- 1. Find the linearization of $f(x) = x^3 - 6x^2 + 7x - 2$ at $x = 2$.

- 2. Find the linearization of $g(x) = \sqrt{5x + 9}$ at $x = 8$.

- 3. Find the linearization of $h(x) = e^{x-2} + 4$ at $x = 3$.

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ABSOLUTE, RELATIVE AND PERCENTAGE CHANGE

■ 1. What is the absolute change of $f(x)$ from $x = \pi$ to $x = 2\pi$?

$$f(x) = 3x^2 - \cos\left(\frac{x}{2}\right)$$

■ 2. What is the relative change of $g(x)$ from $x = 2$ to $x = 3$?

$$g(x) = 2x^4 - 3x^2 - 5$$

■ 3. What is the relative change of $h(x)$ from $x = 0$ to $x = \pi$?

$$h(x) = \tan x + 4x + 2$$

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ESTIMATING ABSOLUTE, RELATE AND PERCENTAGE CHANGE USING DIFFERENTIALS

■ 1. Use differentials to calculate the relative rate of change of $f(x) = 4x^2 + 5x - 8$ at $x = 3$.

■ 2. Use differentials to calculate the relative rate of change of $g(x) = -9 + 2x + 3x^2 - x^3$ at $x = 1.8$.

■ 3. Use differentials to calculate the relative rate of change of $h(x) = \arctan(2x)$ at $x = 1/2$.

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